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MIGHTY MUSSELS!

by Paul Icamina

SINGAPORE, IDRC -- Mussel meat is a good source of protein, and compares favourably with beef, pork, mutton, chicken, eggs, and finned fish. It is fairly rich in nine essential amino acids, especially agrinine, leucine, and lysine. And its shell contains about 90 percent calcium, a good source of feed for chickens.

No wonder then that Singapore, where fish forms about 30 percent of the total animal protein intake, is encouraging increased "farming" of the green-shelled mussel, one of the meatier mussel species, which is a local delicacy.

Singapore's fish consumption of 30 kilos per person is one of the highest in Southeast Asia. But although Singapore is self-sufficient in pork, poultry, and eggs, local fishermen bring in only a quarter of the 60,000 tonnes of fresh fish the island-state consumes yearly. Huge land reclamation and industrialisation schemes in the last two decades have reduced inshore catches.

Mussel is a popular dish in most Asian countries, and a multi-million-dollar industry in some European countries. It is no stranger in Singapore, where it is known locally as kupang, chai-luan, or tam-choy, served either fresh, fried or dried -- anywhere from posh restaurants to open-air food stalls.

Local mussel production, estimated at 500 tonnes a year, is derived mainly from artisanal fishermen, who harvest the shellfish from the poles of their fishtraps at lowtide. Mussels abound in the Johore Strait, a waterway separating the island republic from peninsular Malaysia. There are three areas in the Straits from which spats (or baby mussels) can be collected, and with spatfalls occurring throughout the year, mussel production is possible the year round.

Government researchers have been able to raise mussels on a commercial scale in an experimental fish farm near the Primary Production Department (PPD) fisheries complex at Changi. Now Singapore is promoting half-hectare farms to encourage intensive fish and mussel production. For an annual licence fee of S$500, and a deposit of S$5000, a fisherman can have the chance of producing 17 tonnes of fish or 54 tonnes of mussels each year for the first two years of operation.

"With experience, farmers can double production by the fourth year," says Leslie Cheong, Head of PPD's aquaculture unit. "The level of mussel culture research in Singapore is sufficiently advanced for large-scale development to be implemented. Mussel culture as a protein-rich resource has a great development potential in Southeast Asia," he adds.

Today there are about 40 private fish farms in the Strait, some of them partly or wholly devoted to mussel culture.

The major methods used for mussel farming are raft culture, pole culture, bottom or seabed culture, and rack culture. It has been found that modified raft culture is the most suitable for Singapore conditions.

Rafts are placed lengthwise, in rows, parallel to the flow of the tides. This maximises the use of space, minimizes wave resistance and the cost of anchoring, and reduces the likelihood of tangled ropes beneath the rafts.

The conventional method of raft culture is laborious and time-consuming, because the spat collection and the growing phase are done separately. First, coconut coir ropes are immersed for spat collection. Then, to prevent overcrowding and allow for better growth, spats must be thinned out and transferred to polyethylene ropes for grow-out after two or three months.

At least two workers are required to manage a 150-square metre raft this way. It takes one worker at least one month to produce the 600 thinned ropes needed. The entire operation of thinning is labour intensive and costly -- a major constraint to large-scale mussel culture in Singapore.

Researchers modified the method by cleverly doing away with the thinning process. They used a rope that combines spat collection and the growing phase. This consists of a main rope made of polyethylene, with pieces of coir rope attached in the centre of each metre -- the culture portion -- of the main polyethylene rope. This combination rope is aptly called the "poly-coco" rope.

Harvesting is done after six months, and yield is considerably higher, averaging 52 kilos for a 4-metre rope, compared to 46 kilos by the conventional method. Only one worker is needed when no thinning is required, so the cost of production is also reduced.

In the PPD's pilot mussel farm, the initial cost, including labour, of a 150 square metre raft is about S$4520. Each of the polyethylene ropes has a life expectancy of about one year. Based on the PPD experience, it is estimated that a staff of five would be required for a half-hectare, seven-raft mussel farm.

To increase production and further reduce production costs, it may be possible to harvest three "crops" per year. But the researchers are concerned to maintain a proper balance. With larger parent populations established through increased farming activity, heavier spatfalls could be expected, and yields would increase. But if there is overfishing, the mussel parent population could be depleted, resulting in poor spat collections and lower yields.

Another major constraint to large-scale mussel production is the handling of large quantities of mussels in the shell. The PPD is looking into the establishment of various pre-processing facilities, including a declusterer, a debearder (to remove the byssal threads from the shells), and a desheller.

A raw mussel processor has already been developed. Costing S$7000, it is able to scrape the mussels from the rope, separate small mussels, and decluster and wash the mussels at the same time, at a rate of one tonne per hour. Researchers are now concentrating on a desheller that will cook the local mussels just long enough at just the right temperature to separate the meat from the shells.

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